Does Education Expenditure Promote Economic Growth in Saudi Arabia? An Econometric Analysis

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Abstract

This paper investigates the Keynesian Relations and Education Expenditure in Saudi Arabia during the period (1970-2012) for real Oil GDP and Non Oil GDP. Keynesian Relations investigated that fundamental economic growth is validity to the education growth. In the previous tudies have been tested the three versions of Keynesian Relations to support the existence of long-run relationship between education expenditure and economic growth. We used a method as a time series econometrics techniques to examine how far Keynesian Relations validity can be applied in Saudi economy. The results obtained from the analyses find that the Keynesian proposition can explain the growth of education in Saudi Arabia, which holds for both the Oil and Non Oil income cases. The findings also note that the existence of strong causality for all of Keynesian Relations versions in the long run.

Keywords: Keynesian Relations, Ordinary Least Square (OLS), Co integration, Granger Causality, Error Correction Model (ECM), Augmented Dickey Fuller (ADF), Education Expenditure, Economic Growth, Saudi Arabia

JEL Codes: C22, E62, H52, I21.

1. INTRODUCTION

Keynesian policies are considered a new attempt in the modern times allowing government back into economic equilibrium, as he recognised and attached important role for fiscal policy in affecting the aggregate demand. As part of the dynamic fiscal policy, Keynes suggested that the government should 'revive' the economy by increasing public expenditure or tax cuts during economic recession, which, he suggested would increase the aggregate demand to keep the economy moving towards equilibrium. Thus, in the Keynesian political economy, fiscal policy and particularly government expenditures work as an 'invisible hand of capitalism'. Such government intervention mostly is paid by budget deficits during recession times implying that the government spends more than their resources (Keynes, 1936). For Keynes this did not mean the rejection of capitalism or its working mechanism, but rather using fiscal policy meant the salvation of capitalism. Due to such views rose by Keynes, Virginia School and in particular Buchanan (1977) accused Keynes for the ever-growing government in the Western societies by labelling this as the 'legacy of Keynes'.

There have been efforts and interest in development of education capacity in Saudi Arabia, characterised by the development of human resources with continuing increases in the number of schools and educational institutes and colleges for boys and girls, and the continuing rise in the number of graduates and of undergraduates at different stages of development.

The importance of planning for development lies clearly in the development of human resources - the basis of education - that give it a privileged position in terms of the objectives, strategies and development

plans initiated in 1970.It has increased and sustained allocations to human resource development, especially after the establishment of a modern economy.

The ratio of education expenditures in government expenditure was about 18.45%, which increased to 19.24% in 1986 and to 25.7% in 2010, (Ministry of Economy and Planning, 2012). Also, the ratio of education expenditures in GDP was about 8.24%, which increased to 6.12% in 2010. By 1996 it had fallen to 4.9 per cent education expenditure has remained relatively steady between 10 and 15 per cent for the past 40 years. In real terms, the average annual increase in education expenditure between 1970 and 2012 was 7.6 per cent. The education expenditure remained almost steadily between 1970 and 1985, after which it rose gradually until 1989, then fell very slightly, and has recently begun to increase at a faster rate from 2007 to 2012. However, increased oil revenues encouraged government to develop the education sector in line with the increased GDP and therefore immediate adjustment witnessed in government expenditure.

The data used in this empirical paper aims to analyse the relationship between education expenditure and economic growth in Saudi Arabia within the Keynesian relation with time series annual data for the period of 1970 to 2012. The rest of the paper is organised as follows: section two, presents some empirical results of relevant theoretical and empirical literature on the relationship between government expenditure and economic growth in Keynesian relation and, in section three, presents some empirical results of relevant theoretical and empirical literature on the relationship between the education expenditure and GDP. Section four, presents the three versions of Keynesian relations and their formulae. Section five, investigates the econometric methodology, while section six presents the empirical results of analysis by using the time series techniques. Lastly, section seven, concludes the paper and presents the finding.

2. EMPIRICAL STUDIES ON KEYNESIAN RELATION

In the relatively large body of knowledge, Ansari *et al.* (1997) investigated the Granger causality test to test the income-government expenditure hypothesis for three African countries; and found that the hypothesis of public expenditure causing national income was not supported by the data for these African countries.

Another study by Samudram*et al.* (2009) tested the Keynesian Relation and Wagner's Law on the role of government expenditure on economic growth for Malaysia during the period of 1970–2004. They used the Auto-Regression Distributed Lag (ARDL) model to explain the evidence of a long run relationship between Government Expenditure and Gross National Product (GNP). Their results show that the long run relationship is bi-directional for GNP and Government Expenditure on administration and health, with the structural break in 1998. Thus, they found supporting evidence by for Keynesian Relation and Wagner's Law.

Tang (2008) investigated the relationship between government expenditure and economic growth in the light of Wagner's Law and the Keynesian Relation in Malaysia. The results indicate that the relationship between government expenditure and economic growth are not sTable. The causality supports Wagner's Law during 1985 to 2000, while the Keynesian Relation was present only before 1980.

Biswal*et al.* (1999) tested Wagnerian versus Keynesian Relation by investigating the relationship between national income and total government expenditure for Canada from 1950-1995. They used the two econometric methods, Engle – Granger, two-step Co-integration, and Error Correction Models (ECM). Their findings support the Keynesian hypotheses, which produced evidence for short-run causation implying that national income has increased by increase in government expenditure in the short run.

Likewise, Azam (1998) tested the Keynesian relation by reversing the Gupta's definition to see the effect of government expenditure on GNP. He obtained the same result by using differenced variables.

As the recent sample literature demonstrates, the results are mixed in the case of Keynesian relation. This study aims to contribute to the literature by searching for evidence for Keynesian Relation in the case of Saudi Arabia.

3. EMPIRICAL STUDIES ON EDUCATION EXPENDITURE

In reviewing the literature, Kevin (2000) explores the relationship between education spending and economic growth. He found that public education expenditures are positively associated with future economic growth, although the contemporaneous effect upon growth is negative. Barro et al (2001) examines a panel data of around some countries observed from 1965 to 1995 and finds that growth is positively related to the starting level of average years of school attainment of adult males at the secondary and higher levels.

Study for, Pradhan (2009) investigates the causality between public education spending and economic growth in India during 1951 to 2001. Error Correction Modelling has carried out the empirical investigation. The findings suggest that there is unidirectional causality between education and economic growth in the Indian economy. The direction of causality is from economic growth to education spending and not vice versa.

Chandra (2010) has tested for a causal relationship between education investments and economic growth for India for the time period 1951-2009 using linear and non-linear Granger causality methods. He found that there is bi-directional causality between education spending and GDP for India. Thus, it can be seen that overall, the empirical evidence regarding this relationship for India too is quite mixed.Ansari and Singh (1997) use annual time series data from 1951 to 1987 to study the relationship between spending on education and growth. They found that there is no long run relationship between the two. Bils and Klenow (2000) revealed that there is causality between education spending and GDP.

4. THE VERSIONS OF KEYNESIAN RELATIONS

In modelling the Keynesian Relation, three versions are depicted in Table 1 are reversed as displayed in Table 2. These formulations are based on real GDP. The Keynesian Relation is also formulated with Non Oil GDP as in Table 3.

Table 1: The Original Equations

No	Function
1	$L(EDE) = \alpha + \beta L(GDP)$
2	$L(EDE) = \alpha + \beta L(GDP / P)$
3	$L(EDE/P) = \alpha + \beta L(GDP / P)$

Table 2: Three Versions of Keynesian Relations with Real GDP

No	Function
1	$L(GDP) = \alpha + \beta L(EDE)$
2	$L(GDP/P) = \alpha + \beta L(EDE)$
3	$L(GDP/P) = \alpha + \beta L(EDE/ P)$

Table 3: Three Versions of Keynesian Relations with Real Non Oil Sector of GDP

No	Function
1	$L(\text{Non-Oil GDP}) = \alpha + \beta L(EDE)$
2	$L(\text{Non-Oil GDP} / P) = \alpha + \beta L(EDE)$
3	$L(\text{Non-Oil GDP} / P) = \alpha + \beta L(EDE / P)$

5. ECONOMETRICS METHODOLOGY

a. Ordinary Least Square (OLS)

The ordinary least square test (OLS) is employed to determine the parameters in the equations. R^2 reflects the regression equation's ability to determine the dependent variable's behaviour. The adjusted R^2 is for the degrees of freedom. We have to use the logarithm model because the parameters of the logarithm model have an explanation as elasticises.

b. Stationarity and Unit Root Tests

In testing Wagner's Law, the non-stationary property of the series must be considered first. There are many alternative tests available to examine whether the series are stationary or non-stationary. If the variables under investigation are stationary, this means that the variables do not have unit roots, then the series said to be 1(0). If the variables under investigation are non-stationary in its level form but stationary in its first-difference form, which means that the variables do have unit roots, then they are said to be 1(1). In recent years many macroeconomic time series are non-stationary which means that they contain unit roots that cause many econometric problems. To test the validity of Wagner's Law in the case if Saudi Arabia; we used Augmented Dickey Fuller (ADF) (1979) method to test the unit root (equation 1).

$$\Delta y_t = \alpha + \beta y_{t-1} + \sum_{t-i}^{k} \Delta y_{t-i} + \varepsilon_t \qquad (1)$$

c. Co-integration Test

Co-integration tests used to test the relationship between economic growth and education expenditure. Granger (1980) was the first to propose a connection between non-stationary series and long-run equilibrium. The purpose of conducting co-integration is to explore whether the data exhibit a long-run relationship. Engle and Granger (1987) developed and introduced the theory of co-integration.Johansen (1988), and Johansen and Juselius (1990) presented that the variables under investigate are performed for each version of the Wagner's Law to search for the existence of a long-run equilibrium relationship between the two variables EDE and GDP as well as for EDE and Non Oil GDP.

d. Error Correction Model (ECM)

Engle and Granger (1987) provide such a procedure. The procedure is known as the "Error-Correction Models". The aim of Error-Correction Models is to determine whether co–integration exists between two variables; there must be Granger causality in at least one direction, but the most valuable aspect is that co-integration does not reflect the direction of causality between the variables. The Error Correction Models (ECM) are expected in equation (2) and (3):

$$\Delta \mathbf{Y_t} = \mathbf{a_1} + \boldsymbol{\beta_1}\mathbf{ECT_{t-1}} + \sum_{i=1}^{n} \boldsymbol{\delta_i} \Delta \mathbf{Y_{t-1}} + \sum_{i=1}^{n} \Omega_i \Delta \mathbf{X_{t-1}} + \mathbf{e_t} \quad (2)$$

$$\Delta \mathbf{X_t} = \mathbf{a_2} + \boldsymbol{\beta_2}\mathbf{ECT_{t-1}} + \sum_{i=1}^{n} \mu_i \Delta \mathbf{Y_{t-1}} + \sum_{i=1}^{n} \epsilon_i \Delta \mathbf{X_{t-1}} + \mathbf{e_t} \quad (3)$$

Where: (ECT_{t-1}): The error correction term lagged one period, is equivalent to $(e_t = Y_t - \alpha - \beta X_t)$, this represents the disequilibrium residual of a co-integration equation.

6. EMPIRICAL RESULTS

In this paper we focused on testing Keynesian relation by reversing the three versions of Wagner's, Law, Peacock & Wiseman(1979), Guffman (1968) and Guptan-Michas (1967, 1975).Table 4 summarises the OLS estimation for the Keynesian Relationship with real GDP for all three versions:

Table 4: Summary of Estimation for (OLS) test with Real GDP

D-Variable	Constant	In-Variable	Coefficient	T-test	R^2
L(GDP)	3.5575	L (EDE)	0.926	19.14	0.9016
L(GDP/P)	4.792	L (EDE)	0.513	9.08	0.6734
L(GDP/P)	3.663	L (EDE/P)	0.780	11.58	0.7703

Table 5 summarises the OLS estimation for the Keynesian Relation with real Non Oil GDP for all three versions.

Table 5: Summary of Estimation for (OLS) test with Real Non Oil GDP

D-Variable	Constant	In-Variable	Coefficient	T-test	R^2
L(Non Oil GDP)	1.9866	L (EDE)	0.90945	85.43	0.9945
L(Non Oil GDP /P)	3.22157	L (EDE)	0.57139	26.08	0.9445
L(Non Oil GDP /P)	2.19671	L (EDE /P)	0.85847	63.19	0.9901

In Table 4, the results show that the elasticity of education expenditure with respect to GDP is greater than unity in all three versions, which are in accordance with Wagner's Law related to Keynesian relation. The empirical results also indicate that the elasticity of education expenditure in Keynesian Relation in the three versions is statistically significant.

In Table 5 with respect to Non Oil GDP the results in all the three versions are in support of Keynesian Relations. Thus, the OLS regression analysis produced some encouraging result indicating the positive impact education expenditures have on economic growth or GDP variables.

In checking the time-series features of the data, the results, thus, suggest that all the variables are integrated of order one in the unit root test. The unit root results of each variable used in all the three versions of Keynesian Relations in the case of Saudi Arabia for the period of 1970-2012 indicate that the series are non-stationary in level but stationary after the first difference.

Table 6: Augmented Dickey-Fuller for Stationary Unit Root Tests

Variables	ADF(Level)	ADF(First Differences)
L(GDP)	-3.44	-2.746
L(EDE)	-3.09	-2.757
L(EDE/P)	-3.37	-2.970

L(GDP/P)	-3.44	-2.535
L(Non Oil GDP)	-3.41	-3.291
L(Non Oil GDP/P)	-3.39	-3.894
5% C-Value	-3.493	-1.687

Since all variables under examination are time-series variables; the times series properties of the series has to be investigated to avoid the problem of spurious regression. For this, each series are tested for stationary through apply ADF unit root tests.Table 6, presents the unit root test estimation through ADF tests In the case of the levels of the series; the null-hypothesis of non-stationary cannot be rejected for any of the series. Thus, it is concluded that the levels of all series are non-stationary, but it is rejected with first differences, which suggests that these variables are integrated at the first order or I (1).

In the Table 6, the results indicate that each of the series is non-stationary when the variables are defined in levels. Considering 5% level of significance, the results, thus, suggest that all the variables are integrated of order one in the unit root test. The results of each variable used in all the three versions of Keynesian Relations in the case of Saudi Arabia for the period of 1970-2012 indicate that the series are non-stationary in level but stationary after the first difference.

The co-integration tests are statistically significant at 5% level for determining the long-run relationship between LGDP and LEDE, in the case of real GDP and Non Oil GDP, as depicted in Table 7 and 8 respectively.

Table 7: Co-integration OLS Regression Results for Real GDP

Versions	Dependent Variables	Coefficient	t-stat	Probability	R^2	DW
1	LGDP	0.874	17.89	0.026	0.912	0.890
2	L(GDP/P)	0.539	10.07	0.018	0.702	0.733
3	L(EDE/P)	0.793	12.01	0.005	0.795	0.804

Table 8: Co-integration OLS Regression Results for Real Non Oil GDP

Versions	Dependent Variables	Coefficient	t-stat	Probability	R^2	DW
1	LGDP	0.923	72.14	0.018	0.961	0.919
2	L(GDP/P)	0.621	25.37	0.051	0.940	0.903
3	L(EDE/P)	0.897	52.71	0.024	0.975	0.881

Table 7 and 8 presents the estimation for OLS method for the period of 1970 to 2012 in examining the long run relationship between the Education Expenditure (EDE) and economic growth as measured by Real GDP and Non Oil GDP in the Saudi economy. The results show that there is a long run relationship between the Education Expenditure (EDE) and economic growth in terms of Non Oil GDP

The next step is to test co-integration by using Johansen Co-integrating test of the models with real GDP and real Non Oil GDP. As can be seen in Table 9, in the case of all the related versions with real GDP, co-integrated relationships exist for all the three versions with respect to real GDP in the case of Saudi Arabia, an even stronger result indicating that the real total education expenditure (EDE) and real GDP are subject to an equilibrium relationship in the long-run. Thus, the results imply that there is a long-run relationship between education expenditures and real GDP.

Table 9: Johansen Co-integration Test Results with Real GDP

Equations	Hypothesized No. of CE(s)	Eigen value	Trace Statistic	Critical Value 5%	Prob
1	None	0.29806	22.5771	15.41	0.0000
	At most 1	0.17821	8.4206	3.76	0.0000
2	None	0.29090	21.8521	15.41	0.0000
	At most 1	0.08098	8.3778	3.76	0.0000
3	None	0.28622	21.7785	15.41	0.0000
	At most 1	0.18721	8.2911	3.76	0.0000

In the case of real Non Oil GDP, the Table 10, shows that there is a long run equilibrium relationship between real Non Oil GDP and education expenditure (EDE), as found in the three equations of Keynesian relations at 5% levels. In other words, the null hypothesis of co-integration in all versions of Keynesian relations with respect to real Non Oil GDP, as the Trace Statistic values are greater than the critical value of 5%.

Table 10: Johansen Co-integration Test Results with Real Non-Oil GDP

Versions	Hypothesized No. of CE(s)	Eigen value	Trace Statistic	Critical Value 5%	Prob
1	None	0.26793	21.0726	15.41	0.0000
	At most 1	0.19341	8.5974	3.76	0.0000
2	None	0.33040	17.2386	15.41	0.0000
	At most 1	0.03049	3.8238	3.76	0.0000
3	None	0.29277	25.0288	15.41	0.0000
	At most 1	0.24370	11.1726	3.76	0.0000

In this section, ECM is extended and analysis is presented in the following sections with real GDP and Non Oil GDP. The results in Table 11 indicate that there is long-run unidirectional causality that runs from GDP to EDE; from GDP/P to EDE; from GDP/P to EDE/P in the three versions of Keynesian relation. This is due to the fact that the variables EDE and EDE/P are statistically significant at the 5% level, and the variables GDP and GDP/P are statistically insignificant at the 5% level. Thus, three versions of Keynesian Relations are found to hold for GDP in the case of Saudi Arabia.

Table 11: Causality with ECM test with Real GDP

Versions	Variables	ECTt-1	T-Stat
1	L(EDE)	-0.002848	-2.61
	L(GDP)	-1.10603	-2.56
2	L(EDE)	-0.03125	-3.06
	L(GDP/P)	-0.0978	-2.44
3	L(EDE/P)	-0.0282	-2.80
	L(GDP/P)	-0.1069	-2.54

In the Table 12, the results indicate that there is long run unidirectional causality exists which runs from Non OilGDP to EDE; from Non Oil GDP/P to EDE; from Non Oil GDP/P to EDE/P. This conclusion is due to the fact that the variables EDE and EDE/P are statistically significant at the 5% level, and the variables Non Oil GDP and Non Oil GDP/P are statistically insignificant at 5% level. Thus, it can be concluded that three versions of Keynesian Relations are found to hold for Non Oil GDP in the case of Saudi Arabia.

Table 12: Causality with ECM test with Real Non-Oil GDP

Versions	Variables	ECTt-1	T-Stat
1	L(EDE)	0.39154	3.08
	L(Non Oil GDP)	0.01995	2.32
2	L(EDE)	-0.1754	-3.19
	L(Non Oil GDP/P)	0.12476	3.68
3	L(EDE/P)	-0.1448	-2.69
	L(Non Oil GDP/P)	-0.1185	-3.56

7. CONCLUSION

In this paper, the relationship between education expenditure and economic growth is explored through three versions of Keynesian Relations for Saudi Arabia, using time series annual data for the period 1970 to 2012.

In the analysis, three distinct time series techniques are applied: Initially, the regressions analysis utilised for three versions of Keynesian Relations using Ordinary Least Square (OLS) with real GDP and Non Oil GDP. In the next step, the Unit Root tests through Augmented Dickey-Fuller test for stationary is applied with real GDP and Non Oil GDP. In the following step, co-integrating test for real GDP and Non Oil GDP. Finally, causality tests by using Granger Causality tests are conducted together with ECM.

In overall, the findings in this study suggest that there is a co-integrating relationship between the share of education expenditure in national output and per capita income. The equilibrium relationship indicates that the major determinant of education expenditure in Saudi Arabia, in the long run, is national income. In the case of Real GDP and Non Oil GDP, the versions show that co-integration relationships are found and the test supported the existence of one co-integration.

Finally, Granger's causality tests were used to confirm the causality direction between the variables by using the ECM. Since there exists an ECM to describe the short run adjustment to equilibrium, three versions of the Keynesian Relations are found to hold for both (GDP) and (Non Oil GDP) in the case of Saudi Arabia.

The findings in this study verify the importance of Keynesian relation for a late developing country such as Saudi Arabia, where the private capital for economic development until recently was limited. The fiscal policy in the form of education expenditures has been the engine of economic growth and development in Saudi Arabia. The government revenues raised from oil wealth in Saudi Arabia have been the main source of economic and social development of the country, which generated employment and expansion of the economy as predicated by Keynes.

The findings of this research, hence, verified the validity of the Keynesian Relation in the case of Saudi Arabia, and also indicate the importance of education expenditure for economic development in the cases where the private capital is in short supply as was in Saudi Arabia. This does not imply that government's role for economic growth and development is applauded without any questioning, as the efficiency and effectiveness of using education expenditure is a matter of another debate.

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